

CLAIMS

1. An installation for producing multi-layer composite tubes (16), comprising a shaping device (36) for shaping a metal strip (38) into a metal tube with overlapping longitudinal edges, a welding device (30) for welding the overlapping longitudinal edges, an extruder station (12) with an extrusion head (14) which adjoins the shaping device (36) and which is connected to a first extruder (18) for applying an inner plastic layer and a second extruder (20) for applying an outer plastic layer to the metal tube, and a cooling device (50) for cooling the multi-layer composite tube (116) produced, wherein the extrusion head (14) of the extruder station (12) is disposed stationarily and the first and the second extruders (18 and 20) are arranged facing towards each other in mutual alignment in a line laterally beside the extrusion head (14) in parallel relationship with the production line (16), wherein the extrusion head (14) in the production line (16) is provided between the first and the second extruders (18, 20), characterised in that a third and a fourth extruder (22 and 24) for bonding agent are cardanically mounted to associated stationary column devices (26), wherein the third extruder (22) is associated with the first extruder (18) and the fourth extruder (24) is associated with the second extruder (20).

2. An installation as set forth in claim 1 characterised in that the welding device (30) has a welding station (32) with an ultrasound welding wheel, wherein the welding station (32) is displaceable in a first direction in space (x) parallel to the production line (16), in a second direction in space (y) perpendicular thereto transversely with respect to the production line (16) and in a third direction in space (z) perpendicular to the first and the second directions in space (x and y) with respect to the extrusion head (14) and is pivotable about a pivot axis oriented in the first direction in space (x).

3. An installation as set forth in claim 2 characterised in that the ultrasound welding wheel is connected to a drive motor (34) for the controlled rotary drive thereof.

Sub A' 4. An installation as set forth in one of the preceding claims characterised in that arranged adjacent to the welding device (30) are two closing roller devices (94, 96) which each have more than two closing rollers (98) which are distributed at the periphery and which mutually adjoin.

5. An installation as set forth in claim 4 characterised in that at least two of the closing rollers (98) of the respective closing roller device (94, 96) are radially adjustable.

Sub A' 6. An installation as set forth in one of the preceding claims characterised in that the shaping device (36) has a base element (84) on which pairs of shaping rollers are arranged in succession at mutual spacings in the advance direction of the metal strip (38) to be shaped, wherein the base element (84) is displaceable in the second direction in space (y) transversely with respect to the production line (16) and in the third direction in space (z) vertically and is pivotable about a pivot axis oriented in the second direction in space (y) and about a pivot axis oriented in the third direction in space (z).

7. An installation as set forth in claim 6 characterised in that adjusting wheels (90, 92) are provided for displacement in the second direction in space (y) and about the pivot axis oriented in the second direction in space (y) and for displacement in the third direction in space (z) and about the pivot axis oriented in the third direction in space (z).

Sub A' 3 8. An installation as set forth in one of the preceding claims characterised in that arranged upstream of the shaping device (36) in the production direction is a metal strip unwinding device (44) which is

displaceable in the second direction in space (y) transversely with respect to the production line (16).

9. An installation as set forth in claim 8 characterised in that the metal strip unwinding device (44) has a support element (46) with two reel mountings (42), wherein the support element (46) is rotatable about a vertical axis and the two reel mountings (42) are provided at mutually remote sides of the support element (46).

10. An installation as set forth in claim 8 characterised in that provided between the metal strip unwinding device (44) and the metal strip shaping device (36) is a metal strip storage device (48) which has two vertical side walls (72) which are arranged parallel to each other and to the production line (16).

11. An installation as set forth in claim 10 characterised in that the two side walls (72) of the metal strip storage device (48) are simultaneously displaceable symmetrically in mirror-image relationship with respect to the production line (16).

12. An installation as set forth in one of the preceding claims characterised in that the cooling device (50) has an elongate liquid bath (52) with a nozzle device and with composite tube hold-down devices, wherein the nozzle device is formed with mutually spaced nozzle openings which are directed towards the production line (16).

13. An installation as set forth in claim 12 characterised in that the respective composite tube hold-down device has two mutually spaced rollers which are mounted on a pivotal lever.

14. An installation as set forth in claim 12 characterised in that provided in the liquid bath (52) is a tube clamping-off device (104) which is

reciprocable along the liquid bath (52) and has squeeze-off jaws (114), and that provided at the beginning of the liquid bath (52) is a first actuating device (110) for closing and keeping closed the squeeze-off jaws (114) and provided at the end of the liquid bath (52) is a second actuating device (112) for opening and for keeping open the squeeze-off jaws (114).

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15. An installation as set forth in one of the preceding claims characterised in that provided downstream of the cooling device (50) in the production direction (28) is an optical tube monitoring device (54), a printer (56), a tube draw-off device (58) and a tube winding-on device (60).

16. An installation as set forth in claim 15 characterised in that the optical tube monitoring device (54) has a number of video cameras.

17. An installation as set forth in one of the preceding claims characterised in that there is provided a two-part base device (66) comprising a first base portion (62) and a second base portion (64), wherein arranged on the first base portion (62) are the metal strip unwinding device (44), the metal strip storage device (48) and the extruder station (12), arranged on the second base portion (64) are the optical tube monitoring device (54), the printer (56), the tube draw-off device (58) and the tube winding-on device (60), and the first and second base portions (62, 64) are connected together by means of the cooling device (50).